Light and Lighting

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Is Daylight Enough?

THERE are not a few people, more especially those pre-occupied with the saving of fuel, who, in their hearts, believe that no artificial light is necessary during daylight hours.

Experience during recent weeks must, however, have shaken this impression. In the average office exacting clerical work can only be done with ease near the window—obviously an unpopular spot during recent arctic conditions. In basements and sub-basement premises little can be done without artificial light. Even conferences in committee are not happily conducted by candle light. Small wonder that, as these words are written, a relaxation in regard to office lighting has been announced.

But the public has learned of the need for artificial light in many other ways. Even with the supplementary light of a candle one can only see that there is food of a sort on one's plate; but one cannot properly appraise or select. The hairdresser, in putting finishing touches, has had to hold scissors in one hand and a lighted taper in the other. In the average lavatory one cannot, by daylight alone, ensure that one's hands have been washed successfully. One may not even be able to tell, by visual effort alone, whether a tap is running.

No, it is not enough. In the planning of buildings for the future the need of artificial light to reinforce daylight should always be kept in mind.

I.E.S. Presidential Visit to Cardiff

The I.E.S. Cardiff Centre was visited on February 6 by the President who repeated the address previously given in London on October 8, 1946. In spite of the inclement weather—perhaps even partly because of it, for the Cardiff Corporation demonstration theatre was agreeably heated—there was an excellent attendance. Mr. T. Scott Harrison, Chairman of the Centre, presided, and Mr. J. Trevor Jones (Vice-Chairman) was also present. The President congratulated the Centre on its progress and especially on the series of lectures to school children, to which allusion is made below. In doing so he paid a well-merited tribute to the work of Mr. S. G. Turner to whose efforts as honorary secretary the progress of the Centre has been largely due. A recently issued report on activities for the past year contains an excellent record of meetings and there are other interesting events in store, notably in Swansea on May 8 when the annual general meeting is to be held and an address on modern church lighting is to be given by Mr. W. J. P. Watson. The moving of the vote of thanks for the address was entrusted to Mr. H. D. Ritchie, one of the younger members of the Society whose father, the late Mr. T. E. Ritchie, himself a member of old standing and high repute, is still remembered by many members with respect and affection.

Lectures to Rhondda School Children

Amongst recent I.E.S. activities there is none of greater importance than the organisation of lectures to school children—a field in which several of the Centres have been signally successful. A recent instance is the series recently arranged at Trealaw (South Wales), which were attended in all, by some 1,500 Rhondda children, selected from secondary modern schools and grammar schools in the vicinity. The lectures went with a swing. The children were keenly interested. Had circumstances permitted an attendance very much greater even than the number stated could have been secured. The lectures were on the same lines as those given previously in London and elsewhere and were undertaken by Mr. R. O. Ackerley and Mr. D. C. James. Demonstrations were again a special feature and here the strong local representation of leading firms in the lighting industry as well as the wholehearted co-operation of the Electricity Department of the Rhondda Urban District Council were most valuable. Mr. T. R. Evans, the electrical engineer, and Mr. Springsguth went to great trouble in this connection. Thanks are also due to the

District Education Officer, Mr. W. Morris Jones, whose sympathetic co-operation and practical help were beyond praise and who opened the proceedings and welcomed Mr. Ackerley as the first lecturer. Letters since received by Mr. Turner, as hon. secretary of the Cardiff Centre, from Mr. Morris Jones and Mr. Evans, express high appreciation of the effort, which we hope will be repeated in other areas, and with similar cordial support from education authorities. The plan adopted successfully by the Birmingham Centre of inviting essays from those attending the lectures and offering prizes has again been followed. We hear that quite a number of essays, some showing very creditable understanding and appreciation of points made in the lectures, have already been received. One notes that Mr. Ackerley, to whom the idea of giving such lectures to children in schools is so largely due, once more acted as lecturer. We hope the Society will continue to profit by his indubitable gift in this respect, but if the effort is to be greatly extended some recruiting of lecturers will be necessary. No doubt, however, there is plenty of potential talent within the ranks of the Society.

New I.E.S. Groups

At the annual general meeting of the I.E.S. Birmingham Centre, on February 28, when the President repeated his address, the local hon. secretary, Mr. W. J. P. Watson, presented an informative account of developments. A feature, in addition to the series of papers read, has been a series of varied and successful visits. It was also good to learn that the newly formed group in Stoke-on-Trent is developing well. In the Western area there is every prospect of yet another new group being established, in Exeter. The unprecedentedly severe winter, which recently made travel to Exeter impossible, prevented the holding of the proposed inaugural meeting, but it is hoped to make another effort in the near future.

I.E.S. Presidential Badge of Office

We give above a view of the Presidential Badge of Office recently introduced by the I.E.S., to which reference was made in our last issue (January, 1947, p. 4). It will be seen that the design, embodying a torch encircled by the name of the Society, is of quite a simple character, the width being approximately 2 ins. It will be recalled that Mr. P. V. Burnett kindly devoted considerable care to the design of this emblem, which it is hoped will be used by successive Presidents for many years to come.

Examinations in Illuminating Engineering

Readers of this journal, and I.E.S. members in particular, are reminded of the examinations in Illuminating Engineering conducted by the City and Guilds of London Institute which have now been in operation for a number of years. Two grades of examination, intermediate and final, are arranged and normally take place towards the end of April or early in May. As this is at present almost the only test of the kind applying to illuminating engineering it is of definite vocational value, as a certificate of knowledge to those engaged in or entering the lighting industry. Passing this examination is also one of the conditions attached to Fellowship in the Society and will doubtless also figure in any future scheme for the registration of lighting engineers. During the period of the war entries for the examination were naturally limited, but the authorities, with creditable perseverance have held it without intermission. Now we strongly advise I.E.S. members, and more especially the younger members, to enter if they have not yet done so. A leaflet, giving particulars of the examination and some specimen papers, may be obtained from the I.E.S. headquarters at 32, Victoria-street, London, S.W.1. Candidates usually enter through the agency of colleges or institutions with which they are associated, but in other cases application may be made direct to the Superintendent of the Department of Technology, City and Guilds of London Institute, 31, Brechin-place, London, S.W.7.

Vision by Infra-Red Radiation

Not much has been published regarding devices, based on the emission and reception of infra-red radiation, used during the war to enable snipers and others to "see in the dark." A little is said on this subject in a recent issue of *Illuminating Engineering*. The device embodies a separate sender and receiver for scouting purposes, stated to be so effective that a marksman in total darkness could hit a target the size of a man at a range of 75 yards. The source was apparently quite a simple one, a 6 v. 5 amp. miniature incandescent lamp (90 per cent. of the energy from which is infra red), all visible light being obscured by suitable filters. Reception, it is stated, was effected by an electronic telescope, which results in the formation of a "green picture" by fluorescence. A curiosity of the process is the apparent conversion of long-wave infra-red energy into a short-wave visible form—exactly the opposite of what is usually held to be theoretically possible. It is inferred, however, that this is a special case arising from a complex change of structures which does not involve violation of the theoretical law.

Professional Engineers' Appointments Bureau

Our attention has been drawn to the above Bureau which aims at registration for employment of members of the Institutions of Civil, Mechanical and Electrical Engineers. The Bureau appears to be already filling a definite need. Nearly 1,000 engineers were placed on the register during 1946, of whom about 20 per cent. are known to have obtained posts with employers to whom they were nominated by the Bureau, whilst a considerable number more were offered posts. The conception of a Bureau serving several different institutions seems a good one. There may be an opportunity here for any engineers connected with the institutions mentioned who have special knowledge of lighting. Those interested should apply to the Registrar of the Bureau at 13, Victoria-street, Westminster, S.W.1.

Forthcoming I.E.S. Meetings

(Provisional List)

SESSIONAL MEETINGS IN LONDON

1947.

April 15th. Five Papers as follows :—

1. MR. W. CHIVERS and MR. D. E. JONES on **The Function and Design of Army Searchlights.**
2. MR. W. D. CHESTERMAN and DR. W. S. STILES on **Visibility of Targets in a Naval Searchlight Beam.**
3. MR. J. M. WALDRAM and MR. S. S. BEGGS on **Searchlight Visibility Problems Associated with Anti-Aircraft Searchlight Beams.**
4. DR. H. K. CAMERON, DR. E. H. RAYNER, MR. E. R. THOMAS and MR. G. T. WINCH on **Photometry of Searchlights.**
5. AIR CMDR. W. HELMORE, DR. H. K. CAMERON, DR. F. S. HAWKINS, MR. L. B. W. JOLLEY and MR. L. M. KING-BREWSTER on **High Power Searchlights Capable of Wide Divergence.**

(*At the School of Hygiene and Tropical Medicine, Keppel Street* (*Gower Street*), *London, W.C.*1.) **6 p.m.**

May 13th. Annual General Meeting followed by an **Address** by DR. N. A. HALBERTSMA. (*At the Institution of Mechanical Engineers, Storey's Gate, London, S.W.*1.) **6 p.m.**

MEETINGS OF CENTRES AND GROUPS

1947.

April 1st. DR. A. J. HOLLAND on **Glass in the Service of Light.** (*At the Electricity Showrooms, Market Street, Huddersfield.*) **7 p.m.**

April 2nd. Annual General Meeting. MR. T. THOMPSON on **Aluminium Reflectors with Particular Reference to Mine Lighting.** (*At the Minor Durant Hall, Oxford Street, Newcastle-on-Tyne*). **6.15 p.m.**

1947.

April 3rd. Debate. **Fluorescent v. Incandescent Lamps for Industrial Lighting.** (*At Cheltenham.*)

April 8th. MR. J. M. WALDRAM on **Street Lighting.** (*At the Liverpool Corporation Electricity Showrooms, Whitechapel, Liverpool.*) **6 p.m.**

April 9th. The Future Trend of School Lighting. (*At the Cardiff Corporation Demonstration Theatre.*) **5.30 p.m.**

April 10th. DR. W. J. WELLWOOD FERGUSON on **Lighting in Coal Mines.** (*At the Reynolds Hall, College of Technology, Sackville Street, Manchester.*) **6 p.m.**

April 10th. MR. R. B. MORRIS on **Lighting for Photography.** (*At the Bradford Corporation Electricity Offices, Sunbridge Road, Bradford.*) **7.30 p.m.**

April 11th. DR. R. E. BASTICK on **The Use of Commercial Glass in the Lighting Industry.** (*At the Electricity Showrooms, Bath.*) **7 p.m.**

April 15th. MR. E. W. MAWSON on **Planning for Recreation with Special Reference to Lighting.** (*At the Corporation of Leicester Electricity Department Demonstration Theatre, Charles Street, Leicester.*) **6.30 p.m.**

April 16th. Problems Night. (*At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesborough.*) **6 p.m.**

April 18th. MR. J. S. PRESTON on **Portable Photometers.** (*At the Imperial Hotel, Temple Street, Birmingham.*) **6 p.m.**

April 21st. Annual General Meeting followed by an **Address by the President** (MR. J. S. DOW.) (*At Sheffield University, Western Bank, Sheffield*, 10.) **6 p.m.**

April 22nd. Annual General Meeting followed by an **Address by the President** (MR. J. S. DOW.) (*At the Electricity Showrooms, The Headrow, Leeds.*) **6 p.m.**

April 29th. Annual General Meeting followed by a **Lecture.** (*At the Electricity Showrooms, Market Street, Huddersfield.*) **7 p.m.**

(Secretaries of Centres and Groups are requested to send in particulars of any changes in programme, mentioning subject, author, place, date and time of meeting; summaries of proceedings at meetings (which should not exceed about 250–500 words) and any other local news are also welcome.)

I.E.S. Annual Dinner

Enclosed with this issue of the journal is a further notice relating to the I.E.S. annual dinner, which has been arranged to take place on Wednesday, May 14, at Grosvenor House, Park-lane, London. The president, Mr. J. S. Dow, will receive guests at 6.30 p.m. and the dinner, which will be followed by dancing until midnight, will begin at 7 p.m.

This is the first occasion on which the I.E.S. has held the dinner since the outbreak of war in 1939. It is hoped that members, both old and new, will support this function which proved so popular before the war, and that I.E.S. centres and groups will be well represented.

Attention is drawn to one change in the arrangements. Evening dress is to be optional. Therefore members in difficulty in regard to this point need have no hesitation in attending in morning dress if more convenient. Initial applications for tickets should reach headquarters by **April 19**, after which the possibility of meeting requests to bring additional guests will be considered.

Stage Lighting in Liverpool

We note with pleasure that Mr. L. G. Applebee again scored a success with his lecture on "Coloured and Directional Lighting as applied to the Theatre," which was delivered to the I.E.S. Liverpool Centre on February 11. The meeting was held jointly with the British Drama League and took place in the Liverpool School of Art. Approximately 230 people were present, certainly an excellent audience. As in Bristol Mr. Applebee dealt with his subject very fully, taking nearly two hours for his address. It says much for his gifts as a lecturer that he held his audience during this somewhat lengthy period and that a lively discussion ensued afterwards. A vote of thanks to the lecturer was proposed by the chairman of the British Display Association and seconded by the hon. secretary of the Centre (Mr. K. R. Mackley).

Improved Fluorescent Lamps

A circular issued by the Electric Lamp Manufacturers Association draws attention to the great improvements in the performance of lamps achieved by the use of improved fluorescent powders and electrode materials. As is indicated in the table below increases of 50 per cent. in both life and light output per watt, as compared with the performances of lamps introduced in 1939, have been secured. Many of our readers will doubtless have observed the new lamps which have recently come into service, a feature of which is the somewhat warmer and more pleasing tint of the light though the colour rendering is stated to be just as good as that of the original "daylight" lamps.

Comparison Between Old and New Efficiencies of Fluorescent Lamps
(Type MCF/U—Daylight)

Rating	Luminous Efficiency in Lumens per Watt					
Lamp wattage	Average at 100 hours		Average through life		Final	
	Old	New	Old	New	Old	New
80	35	45	24	38	22	32
40	40	50	30	43	26	36

Lighting in Coal Mines

Summary of a paper read by Mr. J. Ivon Graham at the meeting of the Illuminating Engineering Society held in London on March 11th, 1947

In opening his paper Mr. Graham recalled that in their report issued in 1944, the Technical Advisory Committee (the Reid Committee) appointed by the Ministry of Fuel and Power, stated that "no man can work properly without good light, and this especially when conditions are difficult." The amount of light given by the early forms of safety lamp was so low that one wonders how the miner was able to do any appreciable work. With illuminations of less than 0.05 ft.-c. the answer can only lie in the wonderful capacity of the human eye to adapt itself to low illuminations. But in spite of this adaptability of the eye, illuminations of such a low order, which are less than one-hundredth of that recognised by the Ministry of Labour as the minimum necessary in factories, are very much too low.

Attempts at improved lighting in mines in this country have shown a reduction in accidents, although nothing definite in the way of increased output has been proved. The disease, miner's nystagmus, also seems to be closely connected with poor illumination. In view of the advances in mechanisation which are being made, considerable improvement in the lighting underground both on haulage, roads, and at the coal face is necessary to ensure greater output, greater safety, and cleaner coal.

Portable and Cap Lamps

Until the end of the nineteenth century flame lamps were in almost universal use. Only a few inefficient electric hand lamps were in use before 1913 when legislation brought them into general use. The low illumination produced by both electric and oil lamps was not sufficiently realised until, in 1930, extensive tests on lamps before and after the working shift were carried out by Professor T. David Jones and others. These tests showed that the candle power of lamps after a shift was on the average little more than 50 per cent. of what it was before the shift. A recent report issued by the Ministry of Fuel and Power showed that 29 per cent. of flame lamps and 36 per cent. of electric lamps tested in a recent investigation failed to reach 50 per cent. of the lighting value of the lamps when new, due mainly to unsatisfactory maintenance.

Cap lamps have become more popular of recent years, though many miners prefer to have a source of light giving a general illumination rather than a beam covering a limited area. Since, however, the illumination given by the latest form of cap lamp is so superior to that given by the most modern hand lamp, and bearing in mind the advantages in regard to weight and freedom of movement of the hands, the use of the cap lamp has been encouraged, though it is felt that the range of illumination should be extended to enable the full angle of vision of the eye to be used.

The Reid Technical Advisory Committee considered that a standard of lighting of the order of 0.4 ft.-c. in the general working area of the coal face should be aimed at; this appears to be a reasonable figure although the illumination level required to eliminate eye strain on work of a class normally undertaken by the miner is not really known. Every effort should be made to attain, or exceed, this degree of illumination although, as stated by the committee, the attainment of such a standard with either hand or cap lamps in safety lamp mines is impossible.

Mains Lighting

A logical development of the miner's hand lamp is the transportable self-contained battery lamp though, so far, this idea has not been enthusiastically received. They have not, however, been given a thorough trial, though one objection to their use is that those at present being made and qualifying for the flameproof certificate are extremely heavy. Limited tests have been made but a properly organised and full-scale test might well be arranged. Where it is feasible to install either electric mains or compressed-air lighting equipment, illumination by means of transportable battery lamps is not advocated.

Where electric mains are available at or near the coal face, lighting from this source of power appears to be the most promising, and efficient lighting of the coal face being now considered as a necessity rather than as a luxury the extra cost of this system is no longer regarded as such a serious handicap Early

experiments in this form of lighting, made as long ago as 1881, were severely handicapped by lack of suitable equipment. Legislation has since been amended to permit mains lighting in any coal face, subject to special regulations. The report of the Mine Lighting Sub-Committee points out that the history of coal face lighting is one of successful experiments abandoned after limited trials owing to the failure of each new installation to produce the expected increases in economic advantages. In the several trials that have been made of this form of lighting, although a reduction in the number of accidents has been acknowledged, the frequent replacement of damaged equipment and the additional labour charges involved have tended to militate against its extension.

Mains lighting has been extensively used in the Ruhr coal-field, where illumination at the coal face is seldom below 0.5-ft. candles and often as high as 2.0-ft. candles, resulting, in addition to increased safety, in an improvement in the health of the miners. The problem of glare has also been studied with some success. The reasons for the greater success of mains lighting on the Continent appear to lie in the absence of shot firing and the appreciation of the need for better lighting, with the willingness to accept it as an economic necessity.

Use of Fluorescent Lamps

Consideration has been given to the application of fluorescent lighting in coal-mines, and a trial installation has been in use at Birch Coppice Colliery for some time, employing 18-inch fluorescent lamps with an experimental flameproof fitting. The advantages of this latest form of lighting are:—

(1) The psychological effect of daylight.
(2) High efficiency.
(3) Low brightness.
(4) Longer life.
(5) Only slightly affected by voltage fluctuations.
(6) Safer than tungsten filament lamps.

The action of the Ministry of Fuel and Power in setting up a sub-committee to examine the possibilities of the use of fluorescent lighting at the coal face indicates that the application of what is undoubtedly so far the best system of illumination for mining conditions is now being tackled on a proper scale, and it is hoped that the difficulties which have been encountered with other forms of lighting will be overcome.

The Pneumatic-Electric Lamp

In spite of the active work now in progress for the installation of mains lighting, conditions in many pits, particularly in regard to gas emission, may not permit the application of this form of lighting. Such pits, if equipped with compressed air, have in the pneumatic-electric lamp a means already at hand of greatly increasing the illumination at the coal face.

The lamp is essentially a self-contained lamp and generator operating on compressed air at about 40 lb. per square inch producing illuminations of up to 1-ft. candle at the coal face. The number of lamps in use in this country is not as high as might be expected, due partly to the cost of compressed air and partly to the necessity of moving equipment forward to the coal face each day.

In 1936 a small 40-watt mercury vapour lamp was produced for use with the pneumatic-electric lamp. The marked increase in light output over the tungsten filament lamp made this new lamp a better practical proposition in spite of the greater cost of bulbs. A drawback, however, was the time taken for relighting should the compressed air supply be momentarily cut off or the pressure reduced below that necessary for the generator to function. This disadvantage has been eliminated by the more recent introduction of a lamp using twin fluorescent tubes.

Glare

Under mining conditions every effort should be made to employ light sources of a low brightness, such as that of fluorescent lamps, which is approximately 3 candles per square inch, as against over 100 candles for a 60-watt pearl bulb.

The whitening of the roof and sides of the mine roadways make a great difference to visual comfort and illumination. The new lighting regulations which came into force on January 1, 1947, made compulsory the whitening of certain specified places of permanent or semi-permanent character, but the coal face is not included. Everything possible, however, should be done to ensure the maximum reflectivity at the working face by similar means.

Colour in Factories

At the last meeting of the Colour Group of the Physical Society, held at the E.L.M.A. Lighting Service Bureau on January 29, Mr. H. D. Murray gave an interesting lecture on the use of colour in factories. The reasons for the employment of a colour scheme might, he said, be either economic or aesthetic. The latter aspect had recently been dealt with by Mr. W. Allen, of the Building Research Station, in a lecture before the R.I.B.A. The lecturer therefore devoted most of his remarks to the economic aspect of the matter though, as he pointed out, the aesthetic side had its economic value. An harmonious scheme, free from distracting elements, made for improved morale of the personnel, with consequently better work and improved safety.

The Importance of Backgrounds

Mr. Murray advocated a more or less uniform brightness in the workers' field of view. For ease of working, the immediate background of the object of attention should not differ much in brightness from the object itself; the contrast should be rather one of colour, and some demonstrations on the epidiascope brought this point home to the audience.

Factories, said the lecturer, could conveniently be divided into three groups for the purpose of the subject under discussion. There were those in which the work was all of the same colour, and those in which, while work of different colours was carried on, that done in each individual machine was always of the same colour. Finally, there were the factories in which work of any colour might be carried out on any machine; this was particularly the case with textile factories. In all cases the most important part of the machine was the working area. For factories of the first and second groups this area should be coloured to give a pleasing contrast with the work, while the remainder of the machine could be coloured either similarly or differently. In any case, it was desirable to have the main body of every machine in one room finished in the same colour.

For factories of the third group the immediate background to the work should be coloured a non-saturated green or a neutral so as to give as pleasing a contrast as possible with work of any colour. Highly saturated colours impaired colour discrimination, and it was very desirable that the background should be of a less saturated colour than the work.

Colour Contrast

Mr. Murray then went on to discuss the available information on the subject of colour preference and colour contrast, referring particularly to the work of Mr. Luckiesh, who found that of all colours the yellows were least liked. The colour of the main surfaces of the interior of the factory might well be governed mainly by psychological considerations, and the lecturer caused his audience to smile by defining these as preferences which "were not governed by experimentally ascertainable rules." It had been suggested, he said, that when the work was highly coloured, the general background should be of a complementary colour, and one reason put forward in support of this was that coloured after-images of the work were then suppressed.

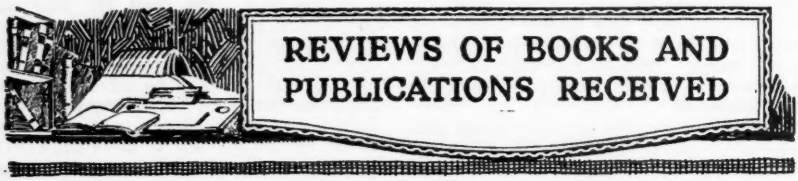
In his own view, said Mr. Murray, the general background should present a balanced picture, with the brightness increasing gradually from floor to ceiling. For this reason he advocated that the reflection factor of the walls should be not less than 50 per cent. and that of the ceiling not less than 75 per cent.

Colour and Temperature.—Some had advocated that the tone of the walls should be related to the average temperature of the room, so that, for example, if the process carried on was such that the general temperature was above normal, the walls should be decorated in a "cold" colour, such as blue. (The lecturer did not suggest that the Minister of Fuel and Power might advocate that all factories should have red interior decoration, but this thought must have occurred to many of the audience, nearly all of whom were wearing overcoats, as the lecture was given on the coldest day of the January cold period and during one of the electricity "cuts.")

Interest and Preference.—In the final part of his lecture, Mr. Murray described some experiments he had carried out on the reactions of a large number of individuals to a wide variety

of colour contrasts. Some of these were liked to a greater or less extent, some were more or less violently disliked, while others again seemed to arouse little interest one way or the other. As a result of the work it had been possible to give the contrasts two ratings: one, the "interest factor," depending only on the amount of interest aroused, whether the reaction were favourable or unfavourable, and the other, the "preference factor," depending on the degree of preference expressed. In general, it could be said that yellows had the lowest interest factors. In a factory, the work and its immediate background should have a high interest factor, whereas that of the general background should be low.

The lecture gave rise to an interesting discussion, in which a number of the points raised by the lecturer were elaborated to a greater or less extent. For instance, Dr. W. D. Wright said he doubted whether a uniform grey decoration would prove to be as depressing as the lecturer had suggested, and he wondered whether, on the other hand, very large brightness differences might prove tiring after a time. In reply to a question by Mr. G. T. Winch the lecturer said that, to his knowledge, some 40 to 50 large industrial organisations were interested in the subject to the extent of carrying out, or planning, colour schemes in their factories. He agreed with Mr. Winch that personal preferences as regards colour could be noticeably influenced by pre-conditioning the observers. Dr. H. Pirenne expressed the view that there was a large psychological gap between a preference expressed for some particular colour or colour contrast, as shown by coloured patches in a laboratory, and the conclusion that workers would be most comfortable if the machines, walls, etc., were treated with those colours. Mr. Murray, in reply, said that the chief value of the laboratory experiments was to indicate what colours or contrasts should be avoided, so that the field was narrowed, and the best colours could then be selected from the remainder, preferably by trial under actual working conditions.



"The Science of Seeing," by Ida Mann and Antoinette Pirie. (Penguin Books, Harmondsworth, Middlesex, 1946, pp. 220; plates viii.)

"To-day we are to speak of optics, the science of seeing," said John Ruskin, in one of his lectures,* given before the University of Oxford just 75 years ago. Nowadays, "optics" seems to be popularly understood as relating almost exclusively to spectacles and optical instruments. Not so for Ruskin. For him, as for the Greeks, it meant the theory of the laws of light and sight; hence—as he put it—"the science of seeing." Long before Ruskin's time, this science had many devotees and exponents, while, in his time, there were some whose contributions to it are of the highest value, and whose expositions are among the classics of its literature. Their's were not "popular" treatises, though Ruskin's contemporary, Helmholtz—famous for his great work on Physiological Optics—brought his subject within the scope of the interested 'man in the street' in some of his popular lectures. Other scientists of the same period, and of our own country, also wrote for "the people" on the science of seeing, though under other titles, such as W. K. Clifford's choice—"Seeing and Thinking."

It was an appreciation of the need for better artificial lighting, and the growth of resources for making this generally available, which brought, in our own time, a book entitled "The Science of Seeing" from the pens of the American authors Luckiesh and Moss. Unaware, perhaps, of the prior use of this phrase in our own country, to denote a body of knowledge greatly enriched by many

* The Eagle's Nest, Lecture VI. The Relation to Art of the Science of Light. February 24, 1872.

British scientists, they made an apt choice. That the same title should be chosen by Prof. Ida Mann and Mrs. Antoinette Pirie for their new book, in the admirable Pelican series, is also fitting. For, not only is their book concerned with the "how" of seeing, but—as Professor of Ophthalmology at Oxford—who has a better right than Miss Mann to adopt an expression long since used at Oxford for the subject on which she writes?

The opening chapters of this book deal with grades and varieties of sight, with the brain and its relation to the eye, and with the constructional features of the latter. In the next three chapters, the authors tell us much that is of interest concerning the kinds of eyes possessed by other living creatures, besides ourselves. This is the subject of comparative sight, and is one which Ruskin, in the lecture to which we have referred, asserted to be far more important than comparative anatomy. In his view, how we compare with lower creatures in, for example, our bodily equipment, for locomotion, is a matter of less consequence than how our seeing compares with theirs; for exactly according to mode of vision, "you have correspondent, not only intellectual but moral faculty in the soul of the creatures." The trend of recent and current world affairs may raise a doubt in the minds of some of us whether, in fact, man's mode of vision is associated with any such intellectual and moral superiority, as Ruskin assumed. This is by the way, but it is interesting to note that Ruskin posed a number of questions concerning comparative sight which are answered by Prof. Mann and her co-author.

The book includes chapters dealing with the materials of which our eyes are made, and also with the properties of visual purple. Then follows a chapter on the perception of colour, through the agency of the retinal cones, and also a chapter dealing with vitamins and vision. By way of introduction to an explanation of ways in which the visual system may go wrong, we are told something about the principal things that may go wrong with other parts of our bodies. Diseases of the eyes are then dealt with, briefly but clearly, and a longer chapter is devoted to anomalies of the eyes, such as the so-called errors of refraction, and imbalance of the ocular muscles, which are not the result of disease or injury. There is a note of reassurance about the authors' remarks upon these subjects, and a note of warning about the futility, and sometimes danger of indulging in irrational "treatments" alleged to improve the sight.

The chapter devoted to facts and fancies about ocular hygiene and spectacles is, as its title suggests, intended to dispel some illusions, and to give us wholesome advice about the proper care of the eyes. Lighting receives brief mention in this chapter. The authors point out that most interior domestic lighting at the present time is on the dim side, and, while deprecating glaring light sources as being extremely unpleasant, they consider a diffuse light of low intensity, reflected from the ceiling and relatively shadowless, to be almost equally annoying to work by. The ideal interior lighting should simulate daylight as much as possible, and glare and annoying reflections from highly polished surfaces in the vicinity of any work in progress should be avoided. The brightness of the work in hand should be slightly more than the general brightness of the room, and it is especially important that the illumination should be adequate for the particular task, since visual acuity depends upon amount of illumination. To those familiar with the I.E.S. Code, these remarks are of interest chiefly as endorsement by the eye specialist of the principles which the lighting specialist follows.

The remaining chapters of the book are concerned with the blind—what they can do and how they can be taught—and with the services available in this country for the diagnosis and treatment of eye defects.

To the layman who is unfamiliar with many of the details of the apparatus of sight, and with its manner of working, the book offers easy and interesting instruction by experts. Naturally, the authors have dealt with their subject from the standpoint of the biologist and ophthalmologist, and this is not the least cogent reason why their book should be read by lighting engineers. And it is certainly a bargain for a shilling!

British Industries Fair

It is announced that the British Industries Fair, which played such an important part in pre-war days, is this year to be revived, and will be held simultaneously in London and Birmingham during May 5-16. The London section is to be divided between Olympia and Earl's Court, and will cover the lighter industries, the heavier industries being, as usual, handled at Castle Bromwich, Birmingham.

National Illumination Committee of Great Britain

(Affiliated to the International Commission on Illumination)

Constitution of the Committee on December 31st, 1946

NOMINATED BY THE CONTRIBUTING ASSOCIATIONS:—

Illuminating Engineering Society: DR. H. BUCKLEY, P. V. BURNETT, J. S. DOW, PROFESSOR T. DAVID JONES, L. H. MCDERMOTT.

Institution of Electrical Engineers: R. O. ACKERLEY, P. GOOD, PROFESSOR J. T. MACGREGOR-MORRIS, SIR CLIFFORD PATERSON, J. W. TOWNLEY.

Institution of Gas Engineers: A. M. BELL, J. E. DAVIS, A. G. HIGGINS, W. HODKINSON, F. C. SMITH.

NOMINATED BY THE CO-OPERATING ASSOCIATIONS:—

Admiralty: H. A. L. DAWSON.

Air Ministry: C. B. COLLINS, J. G. DALGLEISH.

Association of Public Lighting Engineers: E. J. STEWART.

British Electrical and Allied Manufacturers' Association: C. RODGERS.

British Electrical Development Association: V. W. DALE.

British Gas Council: A. M. BELL, D. CHANDLER.

Department of Scientific and Industrial Research: (*National Physical Laboratory*) T. SMITH, DR. J. W. T. WALSH; (*Building Research Station*) W. ALLEN.

Electrical Contractors' Association: C. J. VENESS.

Electric Light Fittings Association: G. CAMPBELL, DR. S. ENGLISH.

Electric Lamp Manufacturers' Association: W. J. JONES.

Glass Manufacturers' Federation: DR. W. M. HAMPTON, G. MARCHAND.

Incorporated Municipal Electrical Association: J. ECCLES.

Industrial Health Research Board: H. C. WESTON.

Institution of Municipal and County Engineers: E. J. ELFORD.

Medical Research Council: PROF. H. HARTRIDGE.

Ministry of Civil Aviation: A. MORTIMER, R. C. I. PEARSE.

Ministry of Health: A. SCOTT.

Ministry of Labour and National Service: E. W. MURRAY.

Ministry of Supply: BRIG. F. H. MACLENNAN.

Ministry of Transport: DR. H. F. GILLBE.

Ministry of Works: G. SMITH.

Post Office: DR. C. G. ROBERTS, W. T. GEMMELL.

Railway Clearing House: A. CUNNINGTON, E. MORGAN.

Society of British Gas Industries: R. J. ROGERS, H. R. STEVENSON, CRAWFORD SUGG.

Society of Glass Technology: DR. B. P. DUDDING.

OFFICERS:—

Chairman: DR. J. W. T. WALSH.

Vice-Chairmen: SIR CLIFFORD PATERSON and F. C. SMITH.

Hon. Treasurer: SIR CLIFFORD PATERSON, Research Laboratories of the General Electric Co., Ltd., Wembley, Middlesex.

Hon. Secretary: L. H. MCDERMOTT, Ministry of Works, 57, Onslow Gardens, London, S.W.7.

Representatives of Great Britain on the Executive Committee of the International Commission on Illumination:—

DR. J. W. T. WALSH and DR. H. BUCKLEY.

ANNUAL REPORT FOR THE YEAR 1946

(Presented at the Annual Meeting of the Committee held on Friday, January 31st, 1947)

It is gratifying to be able to report that considerable progress has been made in the resumption of normal activities; this has been manifest in the re-establishment of contacts with other National Committees, the re-formation of a number of our sub-committees and additions to the bodies represented on the Committee.

Members of the Committee have had the privilege of meeting Dr. Halbertsma, the President of the International Commission on Illumination, when the question of the resumption of international activities was discussed. As a result of this meeting, the Committee is in agreement with holding an informal international gathering in Paris, preferably in 1948.

Correspondence has passed between our Committee and those of France and Hungary.

A comprehensive report has been prepared by the Mine Lighting Sub-committee. This includes sections dealing with portable lamps, mains lighting, and self-contained pneumatic-electric lamps, with particular reference to coal-face lighting; it also contains appendices concerned with the physical properties of glass and organic plastics and their suitability for use in miners' lamps, quotations from various Acts of Parliament and recommendations and various tables giving quantitative data. This report was presented at the annual general meeting of the Institution of Mining Engineers and with the discussion which followed constituted the main business; the report, discussion and reply have been included in the Transactions of the Institution of Mining Engineers, Vol. 105, Part 7, pp. 332-383, and Part 12, pp. 708-710.

Various other sub-committees have been reconstituted and included in these are the following, the name of the Chairman being given in each case:—

Light and Vision (I.C.I. Ref. 4)	Dr. W. S. Stiles
Light Sources (21)	Dr. J. N. Aldington
Natural Daylight (27)	Mr. W. Allen
Automobile Lighting (23b)	Dr. J. H. Nelson
Lighting Education (62a)	Prof. J. T. MacGregor-Morris
Lighting Practice (62b)	Mr. R. O. Ackerley
Theatre Stage Lighting (62e)	Mr. L. G. Applebee

According to the allocation of Secretariats made in 1939, Great Britain is responsible for Light Sources and Theatre Stage Lighting, although others may be added if any re-allocation of subjects is put into effect.

Arrangements are also proceeding for the reorganisation of the Aircraft Lighting Sub-committee under the Chairmanship of W/Cdr. R. H. S. Mealing.

In a few cases, it was decided not to recommence activities for the present, whilst for the remainder of the subjects the British Standards Institution already has sub-committees of the Illumination Industry Committee.

During the year, the following British Standards were issued: B.S. 1249 (Cast iron street-lighting columns), B.S. 1298 (Dimensions of festoon lamp-caps for voltages not exceeding 50), B.S. 1308 (Reinforced street-lighting columns), and B.S. 1316 (Fluorescent and phosphorescent materials excluding radio-active materials).

B.S. 1270 : 1946—Schedule for electric discharge lamps for general purposes has been revised, whilst B.S. 793 : 1938—Tungsten filament electric lamps with partial daylight-colour correction has been cancelled. In addition, amendment slips have been issued to B.S. 161 : 1940—Tungsten filament general service electric lamps (P.D. 464 and 530), and B.S. 867 : 1939 Traction lamps (Series burning) (P.D. 550).

The membership of the Committee has been increased by nominated representatives from the Ministry of Civil Aviation (Messrs. A. Mortimer and R. C. I. Pearse), Building Research Station of the Department of Scientific and Industrial Research (Mr. W. Allen) and the Electrical Contractors' Association (Mr. C. J. Veness). As regards other changes in membership, Mr. J. G. Dalgleish has replaced Mr. A. S. Miers of the Air Ministry, Mr. H. A. L. Dawson represents the Admiralty in place of Mr. J. Rosen, whilst Brig. F. H. Maclennan of the Ministry of Supply has been nominated to succeed Major-Gen. Sproull, and Dr. W. M. Hampton has taken Mr. E. J. C. Bowmaker's place as a representative of the Glass Manufacturers' Federation.

J. W. T. WALSH, Chairman.

Lighting Progress—1946

Reports received from the British Thomson Houston Co., Ltd., The General Electric Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd. indicate the continued progress made during 1946 in lighting matters, both in the laboratory and in lighting practice.

Fluorescent Lamps

An important advance in connection with fluorescent lamps has been the introduction of stable powders which decrease the present rather rapid initial fall in light output and the use of halo-phosphate powders capable of providing in a single powder "white" light radiation.

The application of fluorescent lamps to the lighting of public transport vehicles has been enthusiastically received, and numerous trials have been made in main-line and underground railway coaches, and also in tramcars. This has frequently involved the necessity of converting low voltage D.C. supplies to suitable A.C. voltages for operating these lamps, and special auxiliaries have been designed for this work.

Trial installations of street lighting by fluorescent lamps are in operation at Brompton Road, London (G.E.C.) and Old Bond Street, London (B.T.H.) and are of considerable interest to public lighting engineers.

Cold cathode lighting for interiors is now being developed. For instance the Metropolitan-Vickers Company announce that they are now beginning to produce a new lamp known as the "9-ft. 6-in. lamp." These lamps, which have a loading of 70 watts, will normally be mounted in sets of three operated by cascade transformers, the running voltage of the tube being approximately 630 volts. The lamps will be available in "warm white," "intermediate white," and "daylight" colours, and it is anticipated that there will be a demand for this form of lighting in large stores and offices.

High-Pressure Mercury Vapour Lamps

Experimental work carried out in the research laboratories of the leading lamp companies has resulted in an outstanding improvement in the colour of the light from high power compact source lamps which have been successfully applied to film and studio lighting, whilst excellent results have been obtained when used for colour photography. Experimental lamps up to 25 kW have been produced, and it would appear that efficiencies in the order of 70 lumens/watt are now within reach.

An experimental lantern giving instantaneous restriking has been built in which use is made of special circuits developed to avoid restriking delays usually associated with high pressure mercury vapour lamps. The lamp is prefocused, will operate without attention over a long life, and its steadiness, cleanliness and silence of operation, in addition to its high efficiency and good colour, make it an important introduction for studio lighting.

A further development in cinema studio lighting equipment is announced by the G.E.C., Ltd., who have designed a 150-ampere double negative arc with which, owing to the lower current density in the negative, arc noise is considerably reduced.

Other Developments

Work has been continued on the application of flash discharge tubes over a range of sizes in connection with colour photography. Satisfactory results have been obtained with flashes of 1/5000th of a second, but the time and intensity of the flash may be adjusted as desired. The tubes are capable of giving many thousands of flashes during their life.

In connection with airfield lighting the G.E.C., Ltd., have designed high-intensity beam contact lighting and projector lamp floods. A single 2-kW. floodlight unit provides a peak intensity of about 2.5 million candles and a bank of three units mounted side by side will illuminate 2,000 yards of runway.

Work has been carried out at the research laboratories of the B.T.H. Company on the application of fluorescent lamps to mine lighting. This work has involved studies of the behaviour of these lamps under the conditions of exceptionally rough usage found at the coal face.

The Lighting Engineer in Industry

Summary of an address by Mr. Stuart D. Lay, delivered before the I.E.S. Leeds and Sheffield Centres.

Before dealing with the functions of a lighting engineer attached to a factory organisation it is as well perhaps to mention that, the appointment being a new venture, some administrative adjustment must be made to fit the lighting engineer into the existing organisation. In the first place it must be decided whether he should be attached to one of the works departments, e.g., plant, maintenance, architects, electrical, etc., or be given an entirely new department of his own. Although it would seem that no one department covers the whole of his field of activity there are great advantages in belonging to an executive department of some kind rather than being an "adviser" or "consultant" whose advice is seldom taken.

It should be emphasised in this connection that perhaps the greatest asset a lighting engineer taking up his first appointment in industry can posses, is *tact*. He must remember that lighting was already installed in the factory before he came along and that those who were responsible for it are hardly likely to condemn it as unsatisfactory. He will also have to work very closely with and maintain happy relations with all departments in the organisation.

In common with his opposite number employed by the manufacturer of lighting equipment, the lighting engineer in industry finds that he still has to be a salesman. No one likes spending money on lighting, the economic value of which cannot be shown by a simple calculation, as can be done for a lathe or other piece of production apparatus. Although workers may clamour for better lighting, managements may request it and the lighting engineer show probable advantages for it, the holders of the purse strings have to be persuaded that it is worth the expense. The more evidence the lighting engineer can produce, either by his own ingenuity or with the help of the manufacturers, the better.

On the other hand the lighting engineer coming into industry finds that he becomes a much smaller cog in a much larger machine and is expected to know all the answers regarding his own job. He has only one customer and has to live with all his installations—not always a comforting thought. Think of a very large shop with many workers—if only one worker is dissatisfied with the light as it affects him alone, the lighting engineer will most certainly hear of it.

Importance of Decorations

Technically the job has a far greater and wider interest than that of the commercial lighting engineer, and more time can profitably be spent on jobs which, from the point of view of the latter, are not worth the sale of the equipment involved. For example, the more the question of decoration is considered the more important it becomes—after all the visual effect of 20 lumens/sq. ft. on a surface of 20 per cent. reflection factor is precisely the same as 10 lumens/sq. ft. on a surface of 40 per cent. reflection factor. Add colour contrast and the effect is much more marked. A lighting engineer in industry should indeed be a "brightness engineer." (This brings to mind the question "Should every lighting engineer be a 'brightness engineer'?" But how can he be when he relies for his bread and butter on what he sells—remembering that he doesn't sell paint?)

It is often said that a lighting engineer must approach his problems from the worker's point of view and must be familiar with the process he is asked to light. This is not always easy though most valuable help can often be gained

from those who will eventually work with the installation. Impracticable suggestions are often made but it pays to give them attention and to find out why the suggestion was made. Full discussion between the lighting engineer and the user, be he manager, foreman or workman, will help to produce a satisfactory installation. It is quite true that no matter how satisfactory an installation may be to the experienced eye of the lighting engineer it is not a really good job unless the users are quite happy. The converse however is not true—unfortunately users are only too often satisfied with inefficient lighting schemes.

General and Local Lighting

It is often the practice to prepare lighting schemes which it is claimed produce "an average illumination of x lumens per sq. ft. over the working area." The absurdity of such a specification has been shown by tests recently made in a machine shop provided with a general lighting installation giving "an average of 10 lumens/sq. ft. on the horizontal working plane, 2 ft. 9 in. above the floor." Illumination at the tool point varied between 0.5 and 10.0 lumens/sq. ft. without the use of local lighting, whilst in gangways and storage areas where there was no obstruction and most surfaces were horizontal (and, incidentally, where a lower level of illumination would have sufficed), 10 lumens/sq. ft. was often exceeded. It should be realised that this was not, according to most standards, a badly lighted shop and the management considered it to be well lighted. The measurements quoted above were made when the operatives were in their working positions at the machines.

The answer would seem to be either the use of "localised general" lighting which needs detailed care and considerable experience in planning, or fluorescent lighting in continuous troughing which, though simpler to plan, still requires considerable thought if it is to be efficiently used. Dissatisfaction with industrial installations of fluorescent lighting has frequently been expressed but in almost every case complaints have been traced to faulty planning. This form of lighting will probably replace most other forms of illumination in industry, though it is greatly to be regretted that so many bad examples of fluorescent lighting, which must inevitably retard lighting progress, are to be seen. There is also considerable room for improvement in the design of fittings for use with these lamps.

Lighting Drawing Offices

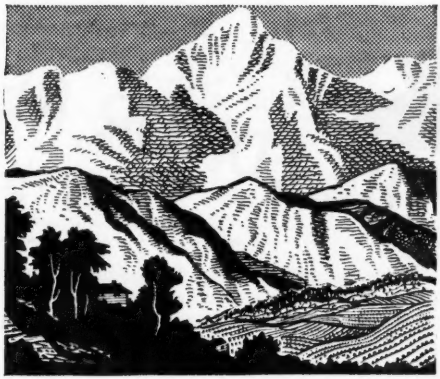
Finally, one might ask if a solution has been found to the problem of lighting drawing offices? If the light is 100 per cent. diffused there is still certain to be a shadow from any object such as a T-square which projects above the paper as the illumination immediately adjacent to the edge is from a quarter sphere whereas the remainder of the lighting is from a hemisphere. This seems to be one of the very few cases where adjustable local lighting can be used with advantage.

Obituary

H. E. CHASTENEY

We regret to report the recent death of Mr. H. E. Chasteney, H.M. Chief Inspector of Factories, as the result of a street accident which occurred after nightfall. Mr. Chasteney was a leading member of the Illuminating Engineering Society, having served on the Council and as a Vice-President. He took a great interest in industrial lighting, to which his most recent annual report as Chief Inspector made detailed reference. His unassuming manner concealed great ability and sagacity, and he will be greatly missed.

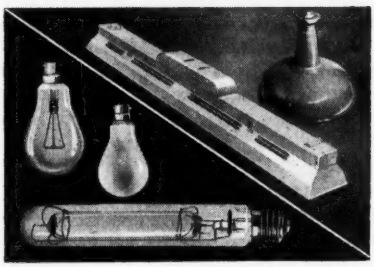
Who FIRST LIGHTED ON HIGH TEA



—*and how high was it?*

Some of the finest tea in the world is grown 7,000ft. up in the Himalayas at Darjeeling. To carry electricity to this lofty spot was an early achievement of that romantic figure, Colonel Crompton, soldier, explorer and engineer.

Coming down to earth, Colonel Crompton's undertakings range from the first electrification of coal-mines and docks to the lighting of such famous buildings as Buckingham Palace and London's Law Courts. In 1885, he introduced his countrymen to domestic house-to-house lighting. The present day Crompton Parkinson organisation is carrying on the pioneer work of its great founder. This is clearly shown in the modern range of Crompton lamps and lighting units and in the expert lighting service available for the planning of complete industrial lighting installations.



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FOR THE LATEST IN LIGHTING

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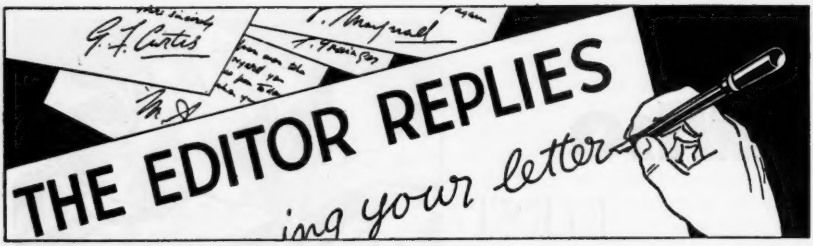
Telephone · Temple Bar 5911 *Telegrams : Crompark, Estrand, London*



I have had some further discussion on the point recently raised by Mr. R. R. Holmes (see January, 1947, p. 16)—the need for some simple and monosyllabic **substitute for "lumen per square foot."** This problem will, no doubt be considered by the B.S.I. Committee concerned with nomenclature symbols, and definitions.

One hopes that they will be able to find some solution, if not **the "lume"** proposed by Mr. Holmes, then some other **easily spoken term.** I believe it has been suggested that an abbreviated version based on the use of initial letters—somewhat similar to the jargon with which we have been made painfully familiar by Government Departments—should be adopted. But this, though an abbreviation in writing, does not produce anything *easy to say.*

On these grounds there is a good deal to be said for the lume. On the other hand there may be a natural objection from the international standpoint to the adoption of new terms confined to the country of origin. Perhaps, therefore, the pundits may prefer to wait for the universal adoption of the metric system and the general adoption of "lux" as the unit of illumination.

I have had some correspondence with Mr. L. G. Applebee in regard to the so-called **"penumbrascope,"** also mentioned in our January issue (p. 16). Mr. Applebee who, I gather, supplied the equipment needed to meet this special demand, explains that the apparatus consists of a translucent screen floodlit in colour from behind, on which are thrown silhouettes by means of projectors and a "cut-out." It may, therefore, be described as a **shadowgraph in colour.** As indicated in our original reference, it is in the nature of a special device to secure a special effect—not, properly speaking, in the nature of a new system of stage lighting.

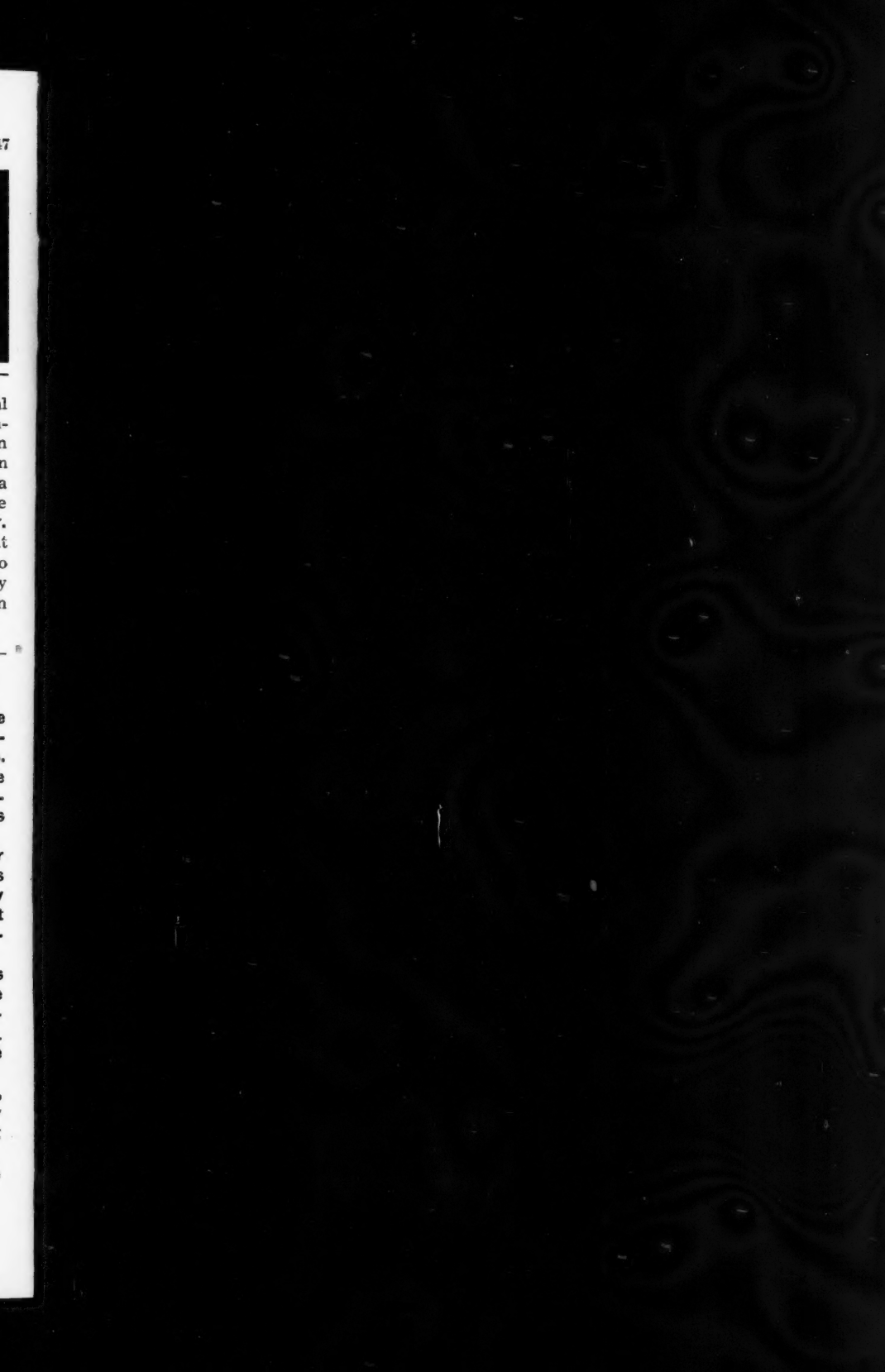
Situations Vacant or Desired

It has for some time been the practice to insert short advertisements of situations vacant or desired in these columns.

We have been asked to extend the practice for the benefit of I.E.S. members in need of employment or desirous of changing their present positions.

We shall, therefore, be pleased to hear of such cases and will do what is possible to be of service—either by bringing parties directly into contact or through the medium of advertisements.

Advertisements from I.E.S. members desiring situations will be inserted free of charge. In the case of firms advertising vacancies, however, the charge is 1s. a line, with a minimum overall charge of 10s.

All entries are keyed by a box number, the names of advertisers, to whom any replies received are forwarded, being regarded as confidential.

The length of such entries should in general not exceed 50 to 60 words.